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# Prevalence and Psychological Correlates of Traumatic Brain Injury in Operation Iraqi Freedom

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**Objective:** To describe the prevalence and psychological correlates of traumatic brain injury (TBI) among injured male combatants in the Iraq conflict. **Participants:** A total of 781 men injured during military combat between September 2004 and February 2005. **Main Outcome Measures:** Mental health diagnosis (ICD-9 290–319), particularly posttraumatic stress disorder and mood/anxiety disorders, assigned through November 2006. **Results:** 15.8% met criteria for TBI (13.4% mild, 2.4% moderate-severe TBI), 35.0% other head injury, and 49.2% non-head injury. Multivariate logistic regression suggested lower rates of posttraumatic stress disorder and mood/anxiety disorders among those with mild and moderate-severe TBI. **Conclusions:** These findings could reflect a problem with differential diagnosis or, conversely, a low rate of self-presentation for symptoms. Further research is needed to elucidate the psychological consequences, clinical implications, and overall impact of TBI among military combat veterans. **Keywords:** military, posttraumatic stress disorder, PTSD, traumatic brain injury

TRAUMATIC BRAIN INJURY (TBI) is defined as brain damage secondary to an externally inflicted trauma and is a significant source of morbidity among military personnel.<sup>1,2</sup> The incidence of TBI during the current US military conflict in Iraq is elevated compared with previous conflicts and has been referred to as the conflict's signature wound.<sup>3</sup> Posttraumatic stress disorder (PTSD), an anxiety disorder triggered by a traumatic event and characterized by symptoms of avoidance, reex-

periencing, and hyperarousal, is a potentially important sequela of TBI.<sup>4–6</sup>

Research on the relation between TBI and PTSD has yielded mixed findings.<sup>6</sup> Some have argued that loss of consciousness, a hallmark symptom of TBI, can result in impaired recollection of the event, thus precluding the reexperiencing symptoms required for PTSD diagnosis.<sup>7–10</sup> Furthermore, studies examining patients with TBI with self-reported amnesia for the traumatic event found low rates of PTSD.<sup>11–13</sup> Severity of TBI may also play a role. In general, research supports the occurrence of PTSD following mild TBI.<sup>11,14–18</sup> Other studies identified an inverse relation between TBI severity and PTSD incidence; those with mild TBI were more likely to develop PTSD than those with more severe TBI.<sup>7,19,20</sup> At least 2 studies, however, found PTSD to be prevalent following severe TBI.<sup>21,22</sup> A recent study by Hoge et al<sup>23</sup> found that among combat veterans, those reporting mild TBI were more likely to meet criteria for PTSD than those with other combat injuries.<sup>3</sup>

In addition to PTSD, multiple studies have found TBI to be associated with major depression, other anxiety disorders, and bipolar affective disorder, and a recent military study found increased rates of somatic and neuropsychiatric symptoms.<sup>24–30</sup> Previous research has been limited by lack of a comparison group and a focus on civilian populations. The experience of TBI in

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military operations may differ in that the circumstances surrounding the causal event (eg, being involved in direct combat) would likely be considered traumatic as well.

The purpose of this study was to describe the prevalence of TBI among a population of battle-injured male combatants and to characterize the presence of psychological correlates of TBI, particularly PTSD. It was hypothesized that TBI would be associated with higher rates of mental health diagnoses compared with non-head injuries.

## METHODS

### Study population

Patients were identified from the US Navy-Marine Corps Combat Trauma Registry Expeditionary Medical Encounter Database (CTR-EMED). The CTR-EMED, a deployment health database maintained by the Naval Health Research Center (NHRC), consists of documented clinical encounters of deployed military personnel.<sup>31,32</sup> Eligible personnel for this analysis were 881 Operation Iraqi Freedom (OIF) male combatants who presented to forward deployed medical treatment facilities for battle injury during the 6-month period from September 2004 to February 2005.

A total of 841 (95.5%) eligible personnel had a matching record in the Career History Archival Medical and Personnel System (CHAMPS). A database maintained by NHRC, CHAMPS contains demographic, career, and medical information of all military members on active duty in the US Armed Services since 1973 (see Gunderson et al, 2004, for a detailed description of CHAMPS).<sup>3</sup> Medical diagnosis information is in the form of inpatient and outpatient clinical records, with diagnoses assigned by providers and subsequently coded. To ensure accuracy of diagnosis codes, US Military Treatment Facilities are required to routinely audit all medical codes; reports of these audits are provided to the Office of the Assistant Secretary of Defense/Tricare Management Activity on a monthly basis. Ten individuals were excluded because of evidence of military discharge less than 90 days into the follow-up period. A total of 50 individuals were identified as possibly sustaining a TBI, but had no documentation of TBI severity and were thus excluded from the study population.

The final study population consisted of 781 patients. Age ranged from 18 to 54 years (mean =  $24.1 \pm 5.4$  years). The majority (75.9%) of patients were Marines, 19.6% were in the Army, and 4.5% were in other services or unknown. Most patients (84.5%) were of ranks E1–E5 (junior enlisted). Of the 781 injuries, 68.0% were minor, 18.6% were moderate, 9.5% were serious, and 4.0% were severe. The largest proportion of injuries (41.3%) was

from improvised explosive devices, followed by other blast injuries (19.1%), and gunshot wounds (17.7%).

### Measures

*Traumatic brain injury* was defined using CTR-EMED clinical records after thorough review by CTR-EMED clinical research staff. A narrative field (completed by the provider at the point of injury) describing the injury was evaluated and a diagnostic code based on the *International Classification of Diseases, Ninth Revision (ICD-9)* was assigned to each. An ICD-9 code in the following ranges was defined as a TBI ( $n = 124$ ): 800–801.9, 803–804.9, and 850–854.1.<sup>2</sup>

Injury severity was described using 2 standardized measures of injury classification assigned by CTR-EMED clinical research staff: (1) Abbreviated Injury Scale (AIS) and (2) Injury Severity Score (ISS).<sup>34,35</sup> The AIS refers to the severity of a specific injury, ranging from 1 (*relatively minor*) to 6 (*currently untreatable*). In the present study, TBIs were categorized as mild (AIS 1–2) and moderate-severe (AIS 3–5). The ISS is an overall measure of injury severity ranging from 0 to 75 and is derived from AIS scores in following 6 body regions: head/neck, face, chest/back, abdomen, extremities, and external.<sup>35,36</sup> In the present analysis, ISS was categorized as minor injury (ISS 1–3), moderate injury (ISS 4–8), serious injury (ISS 9–15), and severe injury (ISS 16 or higher).<sup>37,38</sup> If available, ICD-9 and severity coding were validated using radiological and surgical reports.

Patients with non-head injuries, the reference group, were defined by the presence of an AIS code indicating an anatomic region other than the head, neck, or face. A separate category, other head injury, was used to prevent potential misclassification of TBI within the reference group and was defined as an injury to the head, neck, or face that did not meet the criteria for TBI.

Three outcomes were considered: (1) diagnosis of any mental health problem, (2) diagnosis of PTSD, and (3) diagnosis of mood/anxiety disorder. Diagnoses in the form of ICD-9 codes were abstracted from CHAMPS. CHAMPS was updated through November 2006; therefore, there were approximately 22–27 months of follow-up time, although some participants were discharged from the military over the course of the follow-up period. Upon military discharge, CHAMPS no longer monitors personnel. Those discharged without a mental health diagnosis were assumed to have not developed the outcome.

A diagnosis of PTSD was indicated by an ICD-9 code 309.81, and any mental health disorder was indicated by an ICD-9 code in the range 290–319, excluding 305.10 (tobacco addiction). PTSD diagnosis must have been made at least 1 month postinjury, as the definition of PTSD requires symptoms to persist for at least 1 month;



any diagnosis of PTSD less than 1 month postinjury was treated as a previous mental health diagnosis. Other mental health outcomes of interest included mood disorders (*ICD-9* 296, 300.4, 301.13, 311) and anxiety disorders (*ICD-9* 300–300.02, 300.21–300.29, 300.3, 308.3, 308.9, 309.81). Because of a typically high rate of comorbidity, mood and anxiety disorders were combined for analysis. Though not primary outcomes of interest, rates of adjustment disorders (*ICD-9* 309.0–309.9, excluding 309.81), substance abuse disorders (*ICD-9* 291, 292.0, 292.1, 292.3–292.9, 303, 304, 305.0, 305.2–305.7, 305.9), and other mental health disorders (any other *ICD-9* code between 290 and 319 not previously listed) were also examined.

Other covariates from the CTR-EMED clinical record that were assessed for adjustment purposes include ISS, injury mechanism, age, and military rank. Intelligence, reportedly related to development of PTSD,<sup>39</sup> was measured with the Armed Forces Qualification Test (AFQT) score abstracted from CHAMPS.<sup>40</sup> The AFQT score is computed from a test taken by all enlisted service members upon entrance into the military. The score is based on test sections addressing mathematics and reading comprehension and is expressed as a percentile. Marital status was also abstracted from CHAMPS. Previous mental health diagnosis has been identified as a risk factor for PTSD development; this was ascertained from CHAMPS.<sup>41</sup> Patients with an *ICD-9* code between 290 and 319 (excluding 305.1) at any time while in the military since January 1, 2000, and prior to the date of injury were considered to have a previous mental health diagnosis.

### Data analysis

All statistical analyses were performed with SAS version 9.1 statistical software (Cary, North Carolina). Prevalence of TBI was calculated for the entire cohort and stratified by injury mechanism. Differences across groups by injury status were tested using chi-square and Fisher exact tests for categorical variables and analysis of variance for continuous variables. Prevalence rates for mental health diagnoses were reported by injury status. Logistic regression modeling was used to relate TBI with subsequent mental health diagnosis; covariates significantly associated with injury status ( $P < .05$ ) were adjusted for in this regression analysis.

### RESULTS

Among all injuries, 50.8% involved a head injury. The prevalence of TBI among the total cohort was 15.8% (13.4% mild, 2.4% moderate-severe). Approximately 84% of moderate-severe TBI (16 of 19) cases were additionally confirmed via radiological and surgical reports at higher levels of care. Demographic and injury-

specific variables stratified by injury status (ie, mild TBI, moderate-severe TBI, other head injury, and nonhead injury) are presented in Table 1. Age differed by injury status, though this was only marginally significant ( $p = .05$ ). Military rank, service, marital status, AFQT score, and rate of previous mental health diagnosis did not differ significantly by injury status. Improvised explosive devices were responsible for a larger percentage of TBI and other head injury when compared with nonhead injury.

Rates of mental health outcome by injury status are shown in Table 2. In the overall cohort, the rates of any mental health outcome, PTSD, and mood/anxiety disorder were 30.3%, 16.5%, and 22.0%, respectively. Median time until any mental health diagnosis was 131 days (range = 1–729 days). Rates of any mental health diagnosis among mild and moderate-severe TBI were 27.6% and 47.4%, respectively. Rates for other mental health disorders (including postconcussion syndrome and other disorders classified as organic to the injury) differed significantly across injury groups; those with moderate-severe TBI had significantly higher rates than those with nonhead and other head injuries. Rates of PTSD, mood/anxiety disorders, and adjustment disorders did not differ significantly across injury groups.

Based on a strong association between injury severity (using overall ISS) and any mental health outcome, with minor injuries showing significantly lower rates compared with all other levels (data not shown), multivariate logistic regression was conducted separately for minor injuries (ISS 1–3) and moderate-severe injuries (ISS  $\geq 4$ ). Thus, the minor-injury group contained only mild TBI, and the moderate-severe injury group contained both mild and moderate-severe TBI and was more likely to contain individuals with polytrauma. The minor and moderate-severe injury groups were similar on demographic variables, and the minor injury group was less likely to contain those injured via gunshot wound. Age, injury mechanism, and injury severity were adjusted for in all models. Table 3 shows the results of the logistic regression analysis. Both mild and moderate-severe TBI were associated with lower rates of mental health problems, including PTSD and mood/anxiety disorders. This finding was not present, however, when restricting the analysis to patients with minor injuries overall (ISS 1–3).

### DISCUSSION

To our knowledge, this is one of the first studies from OIF to estimate TBI prevalence and examine subsequent psychological correlates. Among a cohort of male battle-injured veterans, approximately 1 in 6 met the criteria for TBI. Among those with moderate-severe injuries (ISS  $\geq 4$ ), TBI was associated with fewer mental health diagnoses when compared with non-head injuries;

**TABLE 1** *Descriptive statistics by injury status, male injured combatants, Operation Iraqi Freedom, September 2004–February 2005*

Characteristic	Total (n = 781)	Traumatic Brain Injury		Other injury		P <sup>a</sup>
		Mild (n = 105)	Moderate-severe (n = 19)	Other head (n = 273)	Nonhead (n = 384)	
Demographics						
Age, y (mean ± SD)	24.1 (5.4)	25.0 (6.2)	21.5 (3.0)	23.8 (5.1)	24.2 (5.4)	.05
Rank, N (%)						.29
E1–E3	331 (42.4)	41 (39.0)	6 (31.6)	123 (45.1)	161 (41.9)	
E4–E5	329 (42.1)	52 (49.5)	12 (63.2)	110 (40.3)	155 (40.4)	
E6–E9	81 (10.4)	9 (8.6)	0 (0.0)	29 (10.6)	43 (11.2)	
WO/Officer	40 (5.1)	3 (2.9)	1 (2.1)	11 (4.0)	25 (6.5)	
Service, N (%)						.31
Army	158 (19.6)	11 (10.5)	4 (21.1)	59 (21.6)	79 (20.6)	
Marines	593 (75.9)	89 (84.8)	14 (73.7)	204 (74.7)	286 (74.5)	
Other/unknown	35 (4.5)	5 (4.8)	1 (5.3)	10 (3.7)	19 (5.0)	
Married, N (%)	346 (44.3)	45 (42.9)	6 (31.6)	114 (41.8)	181 (47.1)	.35
AFQT, score (mean ± SD) <sup>b</sup>	58.6 (18.9)	60.1 (20.7)	63.6 (16.8)	58.9 (18.3)	57.6 (18.9)	.39
Prior MH diagnosis, N (%)	47 (6.0)	6 (5.7)	1 (5.3)	18 (6.6)	22 (5.7)	.97
Injury specific, N (%)						
Injury mechanism						<.01
IED	323 (41.4)	76 (72.4)	12 (63.2)	149 (54.6)	86 (22.4)	
Grenade	54 (6.9)	1 (1.0)	0 (0.0)	20 (7.3)	33 (8.6)	
Mortar	57 (7.3)	0 (0.0)	1 (5.3)	20 (7.3)	36 (9.4)	
Blast, other	149 (19.1)	24 (22.9)	0 (0.0)	50 (18.3)	75 (19.5)	
Gunshot wound	138 (17.7)	2 (1.9)	5 (26.3)	17 (6.2)	114 (29.7)	
Fragment/shrapnel	43 (5.5)	1 (0.7)	0 (0.0)	12 (4.4)	30 (7.8)	
Other	17 (2.2)	1 (0.7)	1 (5.3)	5 (1.8)	10 (2.6)	
Injury Severity Score						<.01
Minor (1–3)	531 (68.0)	68 (64.8)	0 (0.0)	202 (74.0)	261 (68.0)	
Moderate (4–8)	145 (18.6)	27 (25.7)	0 (0.0)	44 (16.1)	74 (19.3)	
Serious (9–15)	74 (9.5)	8 (7.6)	7 (36.8)	20 (7.3)	39 (10.2)	
Severe (>15)	31 (4.0)	2 (1.9)	12 (63.2)	7 (2.6)	10 (2.6)	

Abbreviations: IED, improvised explosive device; MH, mental health; WO, warrant officer.

<sup>a</sup>Examining differences across categories.

<sup>b</sup>Armed Forces Qualification Test: Due to missing data, sample size is 360, 263, 102, and 19 for nonhead, other head, mild TBI, and moderate-severe TBI, respectively.

similar associations were not found among those who suffered minor injuries (ISS 1–3).

Compared with previous military conflicts, the rate of head injury during OIF was significantly higher. In a meta-analysis of military conflicts between 1914 and 1976, the overall prevalence of head and neck injury among casualties was estimated at 16%.<sup>42</sup> The increased prevalence of head injury in our combat population may be explained by a greater proportion of blast injuries and a greater survival rate for injured personnel.<sup>3</sup> The overall rate of head injury found in this study (50.8%) is consistent with at least 2 studies of OIF casualties. It should be noted that these previous studies assessed head injury, not TBI specifically.<sup>32,43</sup> Two recent studies, however, produced conflicting results. Terrio et al<sup>30</sup> identified 70.2% of veterans who reported combat injuries met criteria for TBI, and Hoge et al<sup>23</sup> found approximately 47% of injured veterans met criteria for TBI; this compared

to only 15.8% in the present study. One possible explanation for these discordant results may relate to the different methods of TBI assessment; Terrio et al and Hoge et al relied on primarily self-report measures, whereas the present study measured provider-diagnosed TBI documented in clinical records from the point of injury.

The present study found, when comparing mild and moderate-severe TBI with non-head injuries, lower rates of mental health diagnoses among overall moderately-severely injured (ISS ≥ 4) patients. Results were significant for mood/anxiety disorders and approached significance for PTSD. Other studies using injured, non-TBI reference groups have yielded contradictory results. One study found rates of depression to be higher among those with severe TBI in comparison with injured controls,<sup>44</sup> and another study found similar 6-month rates of PTSD among those with mild TBI compared with an injured control group.<sup>14</sup> The results depart from other

**TABLE 2** *Mental health outcome by injury status, male injured combatants, Operation Iraqi Freedom, September 2004–February 2005<sup>a</sup>*

Outcome	Total (n = 781)	Traumatic brain injury		Other injury		<i>P</i> <sup>b</sup>
		Mild (n = 105)	Moderate-severe (n = 19)	Head (n = 273)	Nonhead (n = 384)	
Posttraumatic stress disorder	129 16.5	13 12.4	4 21.1	40 14.7	72 18.8	.30
Any mental health diagnosis <sup>c</sup>	237 30.3	29 27.6	9 47.4	74 27.1	125 32.6	.16
Mood/anxiety disorders	172 22.0	17 16.2	4 21.1	53 19.4	98 25.5	.32
Mood only	16 2.0	0 0.0	0 0.0	2 0.7	17 3.7	.08
Anxiety only	101 12.9	11 10.5	1 5.3	32 11.7	57 14.8	.37
Comorbid	55 7.0	6 5.7	3 15.8	19 7.0	27 7.0	.52
Adjustment disorders	72 9.2	4 3.8	3 15.8	28 10.3	37 9.6	.17
Substance abuse disorders	53 6.8	9 8.6	2 10.5	11 4.0	31 8.1	.16
Other	98 12.5	15 14.3	9 47.4 <sup>d</sup>	34 12.5	40 10.4	<.01

<sup>a</sup>Follow-up time ranged from 90 to 820 days.<sup>b</sup>Examining differences across categories.<sup>c</sup>Patients can have more than 1 diagnosis.<sup>d</sup>Significantly different from other head and nonhead injuries after adjusting for multiple comparisons.

studies of military combat populations that found head injury to be positively associated with psychological outcome.<sup>23,45,46</sup> It is imperative to note these previous studies that identified the positive association utilized self-report measures as the primary outcome, whereas the present study utilized diagnoses, which is contingent on self-presenting for care.

There are many possible explanations for lower rates of mental health diagnoses in the TBI group than the

nonhead injury group when considering only those with moderate-severe injuries (ISS  $\geq 4$ ). This may represent problems with differential diagnosis, as physicians may ascribe mental health concerns to the TBI and not assign a psychological diagnosis. Previous studies have elucidated the symptom overlap between TBI and PTSD,<sup>47–49</sup> and other research supports postconcussion symptoms as being similar to mood and anxiety disorders.<sup>50</sup> Conversely, diagnosis may be affected by TBI-related deficits

**TABLE 3** *Final multivariate model, injury status, male injured combatants, Operation Iraqi Freedom, September 2004–February 2005<sup>a</sup>*

Injury status	Diagnosis +/-					
	Any mental health outcome <sup>b</sup>		Mood and anxiety disorders <sup>c</sup>		Posttraumatic stress disorder <sup>d</sup>	
	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Minor injuries, ISS 1–3 (n = 531)		.77		.69		.79
Nonhead	1.00		1.00		1.00	
Other head	1.07 (0.66, 1.75)	.77	1.03 (0.59, 1.79)	0.92	1.03 (0.56, 1.90)	.92
Traumatic brain injury (TBI)	1.29 (0.65, 2.57)	.47	1.38 (0.64, 2.98)	.41	1.34 (0.77, 3.70)	.51
Moderate-severe injuries ISS $\geq 3$ (n = 250)		.13		<.01		.07
Nonhead	1.00		1.00		1.00	
Other head	0.64 (0.33, 1.25)	.19	0.54 (0.27, 1.08)	.08	0.69 (0.33, 1.44)	.32
Mild TBI	0.48 (0.21, 1.13)	.09	0.16 (0.05, 0.49)	<.01	0.28 (0.09, 0.91)	.04
Moderate-severe TBI	0.32 (0.10, 1.01)	.05	0.12 (0.03, 0.48)	<.01	0.27 (0.07, 1.02)	.05

Abbreviations: ISS, Injury Severity Score, TBI, traumatic brain injury.

<sup>a</sup>Adjusted for injury severity, injury mechanism, and age.<sup>b</sup>Includes anxiety, mood, adjustment, substance abuse, and other disorders.<sup>c</sup>Excludes adjustment, substance abuse, and other disorders.<sup>d</sup>Includes only posttraumatic stress disorder.

in processing and expressing of mental health symptoms, or by an aversion to report; military personnel may view TBI-related symptoms as less stigmatizing than mental health symptoms. In addition, extremity injuries may also play a role in the results of the present study. More than 90% of patients in the nonhead injury-group sustained injuries to the extremities. Although this group generally had less severe injuries overall than the TBI groups, injuries to the extremities may result in more immediate and visible disability, whereas disability due to TBI may take longer to become fully recognized. Alternatively, the findings may support the inverse associations previously found for TBI severity and incidence of PTSD and mood/anxiety disorders.<sup>15,51-53</sup> Those with an impaired recollection of the event due to a head injury may not process the memory as completely as those without a head injury, thus not allowing the trauma to be encoded, which may lead to decreased psychological effects. This would not, however, explain the association found with mild TBI. It should also be considered that combat exposure, not measured in the current study, may differ across injury groups. Therefore, the association identified with mental health diagnoses may be a product of other traumatic exposures experienced aside from physical injury; thus, a causal pathway between TBI and mental health outcomes cannot be clearly established. Selective loss to follow-up via military discharge may also play a role. During the first year, those with TBI had a higher rate of loss to follow-up (13%) than non-head injuries (7%), although this difference was not significant. Furthermore, these results should not be interpreted as indicating that those with TBI experience fewer mental health symptoms, but that among this study sample they receive fewer mental health diagnoses.

This study has several limitations. Most studies estimating the prevalence of head injury during previous military conflicts utilized primary injuries only. The present study defined an individual as having a head injury if any of their injuries were to the head, neck, or face; this may have led to a greater divergence in head injury rate compared with previous conflicts. However, because of the high percentage of blast injuries, it is likely that the prevalence of head injury has indeed been higher during OIF compared with previous conflicts. Memory of the event, a potential mediator of the relation between TBI and mental health, was not measured in the present study. TBI (including mild TBI) was defined with AIS scores as opposed to other more widely accepted measures of brain injury severity (eg, Glasgow Coma Scale). Because of the austere environment in which these combat injuries are sustained, Glasgow Coma Scale is often not recorded prior to the administration of life-preserving treatments. As such, AIS is

currently the best retrospective measure of TBI severity for this population, but this does not allow for comparison to studies that categorize TBI severity with other measures.

The primary outcome measures were ascertained from an electronic database that tracks, among other things, medical encounters. Most previous studies in the area of TBI and mental health have utilized survey instruments with all participants to ascertain a diagnosis. To receive a mental health diagnosis in this database, a patient would first have to present for care. This likely led to an underestimation of psychological morbidity due to either an aversion to seek treatment or only the most severe cases presenting. An additional consideration was the high rate of loss to follow-up via military discharge due to the nature of the CHAMPS database, and the inability of CHAMPS to track personnel postdischarge. Small sample size may also have affected the results; with only 19 personnel meeting criteria for moderate-severe TBI, it is difficult to identify statistically or clinically significant associations. As a result of potential bias from self-presentation for care, loss to follow-up, and small number of outcomes for those with moderate-severe TBI, results should be interpreted with caution.

The primary strength of the current study is that, to our knowledge, it is one of the first studies from OIF to examine the prevalence of TBI and its relation to later psychological morbidity. In addition, the injury-specific information available from the Navy-Marine Corps CTR-EMED, including injury mechanism and injury severity, has never before been thoroughly documented within a military combat population. Because this information is collected at baseline, issues such as recall bias are avoided. The use and high matching rate of the CHAMPS database allowed for assessment of demographic variables, as well as previous mental health diagnoses.

In conclusion, the present study found that among a cohort of male, injured OIF combatants, more than one-half had a head injury and one in 6 met criteria for TBI; a majority of the TBIs were mild. Compared with non-head injuries, rates of mental health diagnosis, particularly PTSD and mood/anxiety disorder, were lower among those with mild and moderate-severe TBI; this association was confined to those with overall moderate-severe injuries ( $ISS \geq 4$ ) and may be a result of issues with differential diagnosis or self-presentation for symptoms. Future studies should further clarify post-TBI psychological outcomes in combat populations and should utilize Department of Veterans Affairs' data to follow the course of TBI postdischarge. Traumatic brain injury is prevalent during the current military conflict in Iraq, and this study takes an important step in better understanding its psychological ramifications.



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<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT (maximum 200 words)</b>  <b>Background:</b> The prevalence and mental health sequelae of traumatic brain injury (TBI) during the current U.S. military conflict in Iraq has not been thoroughly examined. <b>Objective:</b> This study aimed to describe the prevalence of TBI among injured male combatants, and examine the role of TBI in the development of mental health outcomes, particularly posttraumatic stress disorder (PTSD). <b>Methods:</b> A total of 831 men who were injured during military combat between September 2004 and February 2005 composed the study population. Patients were followed for mental health diagnoses. <b>Results:</b> Among the total sample, 18.7% were classified as mild TBI, 2.3% as moderate-severe TBI, 32.8% as other head injury, and 46.2% as non-head injury. Among those suffering overall moderate-severe injuries, those with mild and moderate-severe TBI were less likely to receive a mental health diagnosis, particularly PTSD and mood/anxiety disorders. <b>Conclusions:</b> The prevalence rate of head injury among this cohort of injured male combatants was 53.8%; 21.0% of the cohort met the criteria for a TBI. Among moderate-severe injured individuals, those with TBI were less likely to receive a mental health diagnosis when compared with non-head injuries.					
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